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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/996,233	11/28/2001	Victor Vilnrotter	47456/RAG/C766	9956

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CHRISTIE, PARKER & HALE, LLP
PO BOX 7068
PASADENA, CA 91109-7068

EXAMINER	
LEE, DAVID J	

ART UNIT	PAPER NUMBER
2633	

DATE MAILED: 06/24/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/996,233	VILNROTTER ET AL.	
	Examiner	Art Unit	
	David Lee	2633	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *07 February 2005*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-21* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-21* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *28 November 2001* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *2/7/05*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 1-3, 9-14, 16, and 18-20 are rejected under 35 U.S.C. 102(b) as being anticipated by Vilnrotter ("Optical Receivers Using Rough Reflectors." Vilnrotter, Victor A. JPL Publication 85-25. NASA. May 1, 1985).

Regarding claims 1 and 12, Vilnrotter teaches an optical communications receiver for receiving and processing turbulence degraded optical signals (page 1-1, lines 2-7) comprising: a detector array (fig. 2-1, detector array) comprising a plurality of detector elements for detecting a point spread function characteristic of the received optical signal (page 2-1, lines 6-7), wherein each of the plurality of detector elements outputs a detector output characteristic of a portion of the point spread function; a signal processor for real-time processing the detector outputs (fig. 2-1, post-detection processor) to optimize the performance of the optical communications receiver by separating a plurality of performance enhancing detected signals from a plurality of performance degrading detected signals (page 3-4, lines 2-4 and page 4-7, lines 6-10), the signal processor being further configured to: receive the detector outputs from the plurality of detector elements and estimate a signal intensity from each detector output (Eq. 2.3a and page 2-4, lines 11-12); select the performance enhancing detector

outputs by selecting the detector outputs containing sufficient signal intensity to improve the performance of the optical detector (page 4-7: eq. 3.6b calculates the weighting factor for each detector output and the inner detector element and the outer detector element collects the diffracted and scattered signal energy respectively); and combine the performance enhancing detector outputs into a single processed signal characteristic of the instantaneous point spread function (page 4-7, line 9); and a decoder (section 3.2 starting on page 3-4) for detecting the received optical signal in the processed signal and outputting a decoded optically transmitted symbol to a user (fig. 2-1, decoded message).

Regarding claims 2 and 3, Vilnrotter teaches a collecting aperture and a focusing optics (page 2-1, lines 2-3: the reflector collects and focuses the signals).

Regarding claim 9, Vilnrotter teaches that the signal processor processes the received optical signal by ranking the detector outputs and utilizing only those detector outputs with the greatest signal content (eq. 3.7 and page 3-4, lines 2-4)

Regarding claim 10, Vilnrotter teaches that the received optical signal is transmitted in an intensity modulated transmission protocol (page 3-1, lines 1-4).

Regarding claim 11, Vilnrotter teaches that the received optical signal is transmitted in a protocol of M-ary pulse-position modulation (page 3-3, line 9).

Regarding claim 13, Vilnrotter teaches that the step of analyzing comprises calculating weighted log-likelihood functions for each detector output (eq. 3.4 and page 3-2, lines 9-13) and comparing the weighted log-likelihood functions for each detector output to determine the greatest log-likelihood function (eq. 3-5).

Regarding claim 14, Vilnrotter teaches that the step of analyzing comprises ranking the detector outputs based on their signal intensity (page 4-7, lines 6-13), and wherein the step of comparing comprises computing the probability error for each successive set of detector elements (eq. 3.14 and page 4-1, lines 7-8) plus a measured background noise ("background radiation") for each of the detector elements (section 4.1.2 on page 4-3 and see also fig. 4-2).

Regarding claim 16, Vilnrotter teaches that the step of analyzing comprises ranking the detector outputs based on their signal intensity (page 4-7, lines 6-13), and wherein the step of comparing comprises assigning a weighting value to each of the detector outputs according to an approximation of a logarithmic rate for each of the detector outputs (Eqs. 3.6a and 3.6b).

Regarding claim 18, Vilnrotter teaches a method for optimizing an optical communications receiver comprising: detecting an incoming optical signal with a plurality of detector elements such that each detector element outputs a detector output (fig. 2-1, detector array); and optimizing the detector outputs utilizing an optimally weighted signal processing, the optimally weighted signal processing multiplying each detector output with a weighting factor for optimizing optical communications performance (page 4-7, lines 6-13).

Regarding claim 19, Vilnrotter teaches a method for optimizing an optical communications receiver comprising: detecting an incoming optical signal with a plurality of detector elements such that each detector element outputs a detector output (fig. 2-1, detector array); and determining a set of detector outputs utilizing an adaptive

synthesized single-detector signal processing configured to optimize optical communications performance (page 3-5, eq. 3.12, and see also fig. 4-4 when N=1).

Regarding claim 20, Vilnrotter teaches a method for optimizing an optical communications receiver comprising: detecting an incoming optical signal with a plurality of detector elements such that each detector element outputs a detector output (fig. 2-1, detector array); and determining a set of detector outputs utilizing signal-to-noise processing configured to optimize optical communications performance (page 4-7: the signal is processed by collecting as much noise-free signal energy; also, see page A-2: the signal and the noise, "background energy" is processed and each of their respective distribution functions are specified).

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 4 and 5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Vilnrotter in view of Gonsalves et al. (US Patent No. 4,309,602).

Regarding claims 4 and 5, Vilnrotter teaches the claimed limitations as applied to claim 1 but does not expressly disclose that the detector comprises a grid array of NxM detector elements where N and M are both greater than or equal to 4. However, Vilnrotter discloses that using more detector elements would improve the receiver's

performance (page 4-7, lines 17-19). Detectors comprising grid arrays of NxM elements where N and M are both greater than or equal to 4 are well known in the art. For example, Gonsalves discloses a grid array with NxM elements where N and M are both greater than or equal to 4 (13 of fig. 1). It would have been obvious to one of ordinary skill in the art at the time of invention to use an NxM grid array where N and M are both greater than or equal to 4, as done by Gonsalves, to improve the receiver's performance.

5. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Vilnrotter in view of Wentz (US Patent No. 3,740,560).

Regarding claim 6, Vilnrotter discloses the limitations as applied to claim 1 but does not specifically disclose that the detector elements are photomultipliers. However, photomultipliers are well known in the art. For example, Wentz teaches a communication system in which an array of photomultiplier detectors is used to detect a beam of information (see Abstract, last three lines). Photomultipliers have the advantage of a high degree of sensitivity and the ability to amplify weak signals through photomultiplier tubes. Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention to use photomultipliers to detect the weak optical signals from distant sources (Vilnrotter, page 1-1, lines 2-4).

6. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Vilnrotter.

Regarding claim 7, Vilnrotter teaches the claimed limitations as applied to claim 1 but does not expressly disclose that the signal processor operates on the received optical signal at a rate equal to or greater than the Nyquist rate. However, the Nyquist rate is the minimum sampling rate required to reconstruct an original signal. Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention to have the signal processor operate at a rate equal to or greater than the Nyquist rate in order to permit accurate reconstruction and processing of the signal.

7. Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Vilnrotter in view of Nayar et al. (US Patent No. 6,864,916 B1).

Regarding claim 8, Vilnrotter discloses the limitations as applied to claim 1 but does not disclose that the detector outputs are weighted based on a function of a characteristic signal to noise ratio wherein the function is either a logarithmic function or an approximation of a logarithmic function. However, this technique is well known in the art of signal processing. For example, Nayar discloses a detector array (fig. 9) wherein the detector outputs are weighted based on a function of a characteristic signal to noise ratio (col. 11, lines 14-19). It would have been obvious to use the technique of Nayar in the system of Vilnrotter in order to increase performance of the optical communications receiver. Regarding the limitation that the function is an approximation of a logarithmic function - it would have been obvious to one of ordinary skill in the art at the time of invention to express the function of Nayar as a logarithmic function in order to make

some solutions more easier and simpler to solve (i.e. – in differential equations or situations where the unknown appears in the exponent).

8. Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over Vilnrotter in view of Dutt et al. (US Patent No. 5,867,290).

Regarding claim 15, Vilnrotter discloses the limitations as applied to claim 12 but does not expressly disclose that the step of analyzing comprises ranking the detector outputs based on their signal intensity, and wherein the step of comparing comprises assigning a weighting value of 1 to those detector outputs above a specified threshold of received optical signal and assigning a weighting value of 0 to those outputs below the specified threshold to create an effective signal mask. However, the use of masks to block out unwanted signals and pass through desired signals is well known in the art and is just a data weighting algorithm. For example, Dutt teaches an optical communications system utilizing encoding algorithms obtained from outputs of a detector array (Abstract and 73 of fig. 3). The signal is processed in the digital signal processor (74 of fig. 3) and the results are sent to a threshold determining unit (75 of fig. 3). The DSP assigns weighting values to each bit and an effective signal mask is created (col. 3, lines 56-67). It would have been obvious to one of ordinary skill in the art at the time of invention to utilize a signal mask, as done by Dutt, in order to optimize and process a signal.

9. Claim 21 is rejected under 35 U.S.C. 103(a) as being unpatentable over Vilnrotter in view of Jung (US Patent No. 6,097,732) and Watanabe (US Patent No. 5,896,211).

Regarding claim 21, Vilnrotter discloses the limitations as applied to claim 1 but does not expressly disclose that the detector array is a wide-band communications detector or that the signal processor is configured to optimize a bit error rate of the optical communications receiver. Watanabe discloses a wideband communications detector (col. 8, lines 4-9, lines 64-65). It would have been obvious to one of ordinary skill in the art at the time of invention to incorporate the wideband communications detector in the receiver of Vilnrotter in order support wideband carriers, larger frequency ranges, and a larger bandwidth, and also to provide the capability to receive multiple signals from different sources simultaneously. Jung discloses signal processing circuitry configured to optimize bit error rate (col. 4, lines 26-47). It would have been obvious to one of ordinary skill in the art at the time of invention to modify the processor of Vilnrotter so that it would optimize bit error rate, as done by Jung, in order to improve transmission characteristics, increase data reliability and decrease error.

Response to Arguments

10. Applicant's arguments with respect to claims 1-21 have been considered but are moot in view of the new ground(s) of rejection.

11. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

12. Any inquiry concerning this communication or earlier communications from the examiner should be directed to David Lee whose telephone number is (571) 272-2220. The examiner can normally be reached on Monday - Friday, 9:00 am - 5:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jason Chan can be reached on (571) 272-3022. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

DL

JASON CHAN
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2600